Acinetobacter Species Infections among Navy and Marine Corps Beneficiaries: 2013 Annual Report

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By Paul Meddaugh and Uzo Chukwuma
EpiData Center Department
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14. ABSTRACT Since the early 2000s, health professionals increasingly are concerned about Acinetobacter species infections due to demonstrated ability to develop resistance to multiple antibiotics, limiting treatment options. In 2013, Acinetobacter incidence was 5.5 and 4.4 per 100,000 persons per year in the Department of the Navy (DON) and the Department of Defense (DOD), respectively, continuing previously observed descending trends. Active duty Marines had a higher prevalence rate than any other group of service members. A. baumannii was the most common etiologic agent in 2013 was, differing slightly from 2012. In the DON, a negligible increase in overall resistance was noted, though there was an increase in XDR cases. For non-MDR cases in the DON and DOD, providers often prescribed trimethoprim/sulfamethoxazole, consistent with 2012 observations. For MDR/XDR cases in 2013, DON providers most commonly prescribed colistin, minocycline, piperacillin/tazobactam, and trimethoprim/sulfamethoxazole. DOD providers most commonly prescribed ciprofloxacin for these cases. Although different from 2012, 2013 prescribing patterns were consistent with recommendations. Among DON and DOD beneficiaries respectively, organisms were most susceptible to cefepime and gentamicin while least susceptible to ampicillin and nitrofurantoin; consistent with observations for the DON and DOD from 2012.			
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Abstract

Since the early 2000s, health professionals increasingly are concerned about *Acinetobacter* species infections due to demonstrated ability to develop resistance to multiple antibiotics, limiting treatment options. In 2013, *Acinetobacter* incidence was 5.5 and 4.4 per 100,000 persons per year in the Department of the Navy (DON) and the Department of Defense (DOD), respectively, continuing previously observed descending trends. Active duty Marines had a higher prevalence rate than any other group of service members. *A. baumannii* was the most common etiologic agent in 2013 was, differing slightly from 2012. In the DON, a negligible increase in overall resistance was noted, though there was an increase in XDR cases. For non-MDR cases in the DON and DOD, providers often prescribed trimethoprim/sulfamethoxazole, consistent with 2012 observations. For MDR/XDR cases in 2013, DON providers most commonly prescribed colistin, minocycline, piperacillin/tazobactam, and trimethoprim/sulfamethoxazole. DOD providers most commonly prescribed ciprofloxacin for these cases. Although different from 2012, 2013 prescribing patterns were consistent with recommendations. Among DON and DOD beneficiaries respectively, organisms were most susceptible to cefepime and gentamicin while least susceptible to ampicillin and nitrofurantoin; consistent with observations for the DON and DOD from 2012.

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Executive Summary

The EpiData Center Department (EDC) at the Navy and Marine Corps Public Health Center (NMCPHC) conducts routine surveillance of clinically significant organisms within the Department of the Navy (DON), as well as the Department of Defense (DOD). This report provides a summary of *Acinetobacter* species incidence and prevalence in calendar year (CY) 2013 and describes the demographics, clinical characteristics, prescription practices, and antibiotic resistance patterns observed among all DOD beneficiaries as well as active duty DON service members and recruits.

Linking several data sources in this report allows for the assessment of a variety of unique descriptive and clinical factors related to *Acinetobacter* within multiple populations. Health Level 7 (HL7) formatted microbiology data were used to identify *Acinetobacter* cases. These isolates were then matched to three databases. Microbiology records were matched to HL7 formatted pharmacy data to assess prescribing practices associated with *Acinetobacter* cases. Cases were also matched to the Standard Inpatient Data Record (SIDR) database to determine exposure associations within the healthcare system. Microbiology records were also matched to the Defense Manpower Data Center (DMDC) active duty roster to determine the burden of *Acinetobacter* among active duty DON service members and recruits. The linking of these various data sources allows for the broadest view of *Acinetobacter* among DOD health care beneficiaries seeking care within the Military Health System (MHS).

This summary of *Acinetobacter* incidence within the MHS in CY 2013 follows previously observed disease dynamics with normal seasonal and geographic patterns and a continued descending trend in incidence. A similar descending trend was observed among DON active duty service members. Additionally, active duty Marines presented a prevalence rate much higher than members of any other active duty service, indicating potentially unique exposure for this population. The prevalence of multidrug-resistant (MDR) *Acinetobacter* remains low in the DON with no extensively drug-resistant (XDR) or pandrug-resistant (PDR) cases identified; however, four XDR cases were identified in the DOD. Further, DON active duty service members accounted for the majority of resistant cases. The majority of *Acinetobacter* species cases in all populations were found in the outpatient setting and were manifesting as non-sterile or skin and soft tissue infections (SSTI). Antibiotic resistance patterns have remained relatively stable with several treatment options showing good susceptibility MHS-wide. Understanding the current disease dynamics will help ensure military health providers have the best information possible, thus promoting quality care and mission readiness.

Introduction

Acinetobacter species are gram-negative bacteria that have shown significant increases in resistance to traditional antibiotics over the past several decades. The most clinically important species are *A. baumannii*, *Acinetobacter* genomic species 3, and *Acinetobacter* genomic species 13TU, which are associated with a large number of infections and demonstrate a remarkable ability to acquire resistance.[1-3] Using normal phenotypic tests, these three species, plus *A. calcoaceticus* (a common environmental organism not associated with clinically relevant disease), are difficult to distinguish from one another. Because genetic testing is not always practical, experts commonly refer to these four species as the *A. baumannii-calcoaceticus* complex, or ABC.[1-5] *Acinetobacter* species other than the three clinically relevant ones already mentioned have rarely been implicated in clinical infection and are not of significant concern.[2]

The ease and frequency of human travel around the world creates a significant risk for acquisition and transmission of novel infections and/or novel resistance strains.[6] Multiple European, North American, and Asian hospitals have reported endemic levels of *Acinetobacter* isolates displaying multidrug resistance, as have hospitals in Argentina, Brazil, some South Pacific Island nations, and the Middle East.[6] The presence of endemic MDR *Acinetobacter* around the world allows for the potential movement of these differing resistance strains into new environments thus creating novel infections within these new environments. Furthermore, this creates a risk that MDR strains will pick up new resistance determinants from novel strains, and vice versa, potentially creating an even more highly resistant organism.

Certain climatic conditions facilitate the transmission of *Acinetobacter* in the community as well as in the hospital.[4] *Acinetobacter* species are hydrophilic and thrive in hot and humid environments,[4] thus infections peak in summer and fall months. Although indoor temperatures are kept relatively stable through heating, ventilation, and air conditioning systems, changes in outdoor humidity can alter moisture levels within buildings, allowing for seasonal variation of *Acinetobacter* infections within the hospital environment.[7]

Experts consider *Acinetobacter* to be ubiquitous in nature as various species have been isolated from soil and surface water samples; however, this has led to the misconception that *A. baumannii* is also pervasive.[8-11] *A. baumannii* is rarely a component of normal human skin flora and has a low incidence of colonization.[2] Infections related to *A. baumannii* typically target moist tissues (e.g., mucous membranes) or areas of exposed skin.[12] At particular risk for *A. baumannii* infection are military service members deployed to combat theaters of operation, particularly in the Middle East.[13]

Historically, categorization of antibiotic resistance in bacteria was challenging because of a lack of standard definitions. In recent years, however, international experts established consistent definitions and categorized bacterial resistance into three groups: multidrug-resistant (MDR), extensively drug-resistant (XDR), and pandrug-resistant (PDR).[21] Refer to Appendix A (Table A1) for group definitions as well as antibiotic categories specific to *Acinetobacter*.

MDR *Acinetobacter* species infections occur with greater frequency in United States (US) service members injured in Middle Eastern countries compared to their counterparts stationed in the US.[6,13-20] Providers frequently isolate antibiotic-resistant *Acinetobacter* infections, most often ABC, from US service members wounded during combat in support of Operations Enduring Freedom (OEF) and Iraqi Freedom (OIF).[16] Clinicians have estimated that the mortality associated with *Acinetobacter* infections complicating combat injuries is as high as 30%.[6] Furthermore, isolates identified from service members returning from OEF and OIF missions were significantly more antibiotic resistant than isolates commonly found in the US, including those found in non-deployed service members.[17,18] Of service members medically evacuated from Iraq and Afghanistan from March 2003 through February 2005, 89% had isolates resistant to at least three different antimicrobial classes.[18]

Acinetobacter is adept at responding to antimicrobial pressure and develops resistance much more quickly than most bacteria. Various strains have developed resistance to all currently available antibiotics.[11,21] Posing further infection control challenges, *A. baumannii* has a remarkable survivability for prolonged lengths of time in the hospital environment, sometimes lasting up to several years.[11] Despite the prevalence of *A. baumannii* in the hospital environment, data describing community carriage are rare and there is disagreement as to whether extra-hospital reservoirs even exist. Evidence of community carriage/reservoirs have only been discussed in the literature for the past 15 years and focus only on single events or cases.[11] *A. baumannii* strains known to infect humans have also been isolated from animals, logically leading to the hypothesis that they could establish a community reservoir. Veterinary nosocomial spread has been described among animals, mainly in veterinary hospital intensive care units. This suggests the possible existence of an extensive community reservoir with the potential for zoonotic spread.[11,22]

The EpiData Center Department (EDC) conducts routine bacteriology and antibiotic susceptibility surveillance using electronic health data including microbiology culture and antibiotic susceptibility results, inpatient encounter records, and active duty rosters. This report updates previously reported retrospective data. It further describes the demographics, clinical characteristics, prescription practices, and antibiotic susceptibility patterns for cases of *Acinetobacter* species among Department of the Defense (DOD) beneficiaries as well as Department of the Navy (DON) active duty service members and recruits.

Methods

Study Design, Setting, and Population

This annual report is a retrospective surveillance summary for calendar year (CY) 2013 assessing the burden and trends of *Acinetobacter* species throughout the DON and DOD. The EDC assessed all outpatient and inpatient isolates as determined by the Medical Expense and Performance Reporting System (MEPRS) codes in microbiology data. For active duty service members, recruits, and beneficiaries who sought care within the Military Health System (MHS), a MEPRS code of 'A' indicated isolate collection in the inpatient setting. All other MEPRS codes were considered outpatient. To estimate annual prevalence, the first *Acinetobacter* species isolate per person, per month was retained as a unique case for analysis. The first *Acinetobacter* isolate per person, per year was used to identify the incidence of *Acinetobacter* and calculate the annual incidence rates.

Data Collection, Processing, and Analysis

Health Level 7 (HL7) formatted microbiology data that originated from the Composite Health Care System (CHCS) at fixed military treatment facilities (MTFs) were used to identify *Acinetobacter* cases. The EDC received data from the Defense Health Services Systems Program Executive Office of the Military Health System approximately two days after each record was certified. The data contained inpatient and outpatient encounter records for beneficiaries who received care at fixed MTFs. Data did not include records from purchased care providers, shipboard facilities, battalion aid stations, or in-theater facilities. Surveillance cultures, defined as specimens isolated from nares, axilla, groin, toe webs, and rectal swabs, were excluded in this analysis as surveillance cultures are typically indicative of colonization and not true infection. The EDC utilized the World Health Organization's (WHO) BacLink and WHONET applications to organize antibiotic susceptibilities within microbiology records. Microbiology data were used to identify the beneficiary's service (Air Force, Army, Marine Corps, or Navy), and the beneficiary's gender.

To determine active duty status for DON cases, the EDC matched the microbiology cases to the Defense Manpower Data Center (DMDC) active duty roster for CY 2013 using a unique patient identifier. The beneficiary status of all other beneficiaries was determined using the microbiology record. Recruits were not included as part of the active duty component for this study. DON recruits were identified separately, also using the DMDC active duty roster when a person's start of federal service date occurred during CY 2013. The end of recruit training was estimated as the start date of federal service plus nine weeks for Navy recruits or 13 weeks for Marine recruits. Recruit cases were defined as those having a microbiology record that fell between the first day of federal service and the last day of basic training plus seven days. Seven days post end of basic training was used to ensure all *Acinetobacter* cases related to the recruit training environment were included.

To evaluate laboratory-confirmed *Acinetobacter* cases for recent healthcare exposure, the

Standard Inpatient Data Record (SIDR) was matched to microbiology records where the HL7 specimen collection date was between the SIDR admission date and up to seven days following the SIDR discharge date. Hospital-onset (HO) cases were defined as *Acinetobacter*-positive specimens collected after the third day of the admission. Healthcare-associated (HA) cases were defined as those who had a current admission with an *Acinetobacter*-positive lab result and a prior hospitalization within the previous calendar year. Community-onset (CO) cases were defined as those beneficiaries having *Acinetobacter*-positive lab results collected within the first three days of admission, indicating the patient acquired the organism within the community and likely arrived at the treating facility with the organism.[23]

Demographic and clinical information for each specimen was described using information within the HL7 microbiology record. Specimen sources of *Acinetobacter* cases were categorized by the specimen source or body site fields in the microbiology record. Blood, cerebrospinal fluid, pleural fluid, pericardial fluid, peritoneal fluid, synovial fluid, and bone were categorized as sterile sources. Skin and soft tissue infections (SSTIs) were considered specimen sources originating from wounds, abscesses, skin, lesions, pustules, cellulitis, boils, pus, carbuncles, cysts, wound drainage, wound discharge, and wound exudates. All other specimen sources were classified as non-sterile.

The EDC created an antibiogram for *Acinetobacter* species identified in 2013 using antibiotic susceptibility testing results within the HL7 microbiology record according to the Clinical and Laboratory Standards Institute (CLSI) guidelines (2009), which calls for the inclusion of a single *Acinetobacter* species isolate per person per year.[24] The EDC selected antibiotics for the antibiogram based on a 2007 report on *A. baumannii* antibiograms[25] and consultation with a subject matter expert.

Susceptibility results from the microbiology record were used to establish the level of antibiotic resistance among cases. Isolates that were non-susceptible (resistant or intermediately susceptible) to at least one drug from at least three different antibiotic classes were considered MDR. The antibiotic classes of interest in this classification included select penicillins, cephalosporins, fluoroquinolones, and aminoglycosides. Organisms that were non-susceptible to at least one antibiotic in all but one or two classes of nine classes in the definition were considered XDR. Finally, PDR organisms were organisms that were non-susceptible to all antibiotics in all antibiotic classes considered relevant.[2,5,21] For the remainder of this report, unless otherwise stated, resistant and resistance are defined as *Acinetobacter* cases having any level of antibiotic resistance, whether it be MDR, XDR, or PDR. See Appendix A (Table A1) for a list of antibiotics used to identify the level of resistance among cases.

HL7 pharmacy records were used to identify antibiotic prescriptions presumed to be associated with *Acinetobacter* cases. HL7 formatted prescription data are generated in three distinct categories depending on clinical setting and administration route: outpatient oral, inpatient oral, and intravenous (IV). For this analysis, prescriptions were presumed to be associated with an *Acinetobacter* case if the pharmacy transaction date was within seven days of the HL7 microbiology specimen collection date.

A geographic information system (GIS) map was created using ArcGIS to show the overall prevalence of *Acinetobacter* by climate regions within the continental US (CONUS). Organisms identified in each region act as a reservoir within that region and contribute to the burden of exposure. The US postal ZIP code of the requesting Defense Medical Information System (DMIS) identification (ID) number, an identifier unique to each MTF, in the microbiology record was used to establish the geographic location where a case originated. Each isolate was categorized into one of two groups: isolates from MTFs within the CONUS or those outside of the continental US (OCONUS). The CONUS prevalence rates and the percent change in prevalence rates from CY 2012 to CY 2013 were mapped by climatic region based on the postal ZIP code of the requesting facility. Climatic regions were defined by the US Department of Energy's (DOE) Guide to Determining Climate Regions by County, 2010.[26] ZIP codes were assigned to climatic regions based on each ZIP codes average temperature and rainfall/humidity as measured by the DOE. Climatic regions were designated as hot-dry, hot-humid, marine, mixed-humid, cold, very cold, and subarctic. For more details on the definition of climate zones, please refer to the aforementioned DOE climate guide. Climatic region prevalence rates for 2013 were calculated as the number of cases identified in each climatic region per the total MHS Data Mart (M2) beneficiary counts of all ZIP codes within the climate region. M2 is a depository of data on TRICARE eligible DOD beneficiaries. Because beneficiary counts fluctuate on a monthly basis, the EDC followed the recommendation of subject matter experts and used the beneficiary count from July of each year as an estimate for the entire year.

To provide context for CY 2013, climatic region rates were compared to CY 2012 by calculating the percent change for each region between the two years. The percent change from 2012 was determined as the difference between the rates for 2013 and 2012 divided by the 2012 rate. Refer to Appendix A (Figure A1) for a map displaying the overall distribution of *Acinetobacter* cases across the world using the geographic location methodology described above. Each beneficiary's service branch was displayed by state based on the location of the MTF requesting the test. Resistant isolates were included as a percentage of all isolates occurring within a state.

Monthly and annual incidence rates were calculated using M2 beneficiary counts to obtain the number of TRICARE eligible beneficiaries by overall population. Beneficiary counts were retrieved monthly to calculate the monthly incidence rates. The annual rates from 2005-2013 were analyzed to determine whether a monotonic trend in infection rates was present using a two-tailed Cochrane-Armitage trend test for linearity of categorical data.

To provide context for 2013 incidence rates, the EDC calculated historic mean incidence rates from 2008-2011 for eligible DOD beneficiaries and DON active duty service members. The historic mean was calculated as the annual incident case count with M2 beneficiary count denominators from 2008-2011. The 2008-2011 timeframe was selected for the historic mean because it represents the most stable years of *Acinetobacter* incidence in the DON and DOD. Monthly and quarterly rates (for 2013 and quarterly historic mean) were calculated to assess seasonality. The quarterly incidence rates were calculated as an incident case count for the three months of each quarter in each year from 2008-2011 with denominator from M2 beneficiary counts for each quarter from 2008-2011 for eligible DOD beneficiaries.

Results

DON/DOD

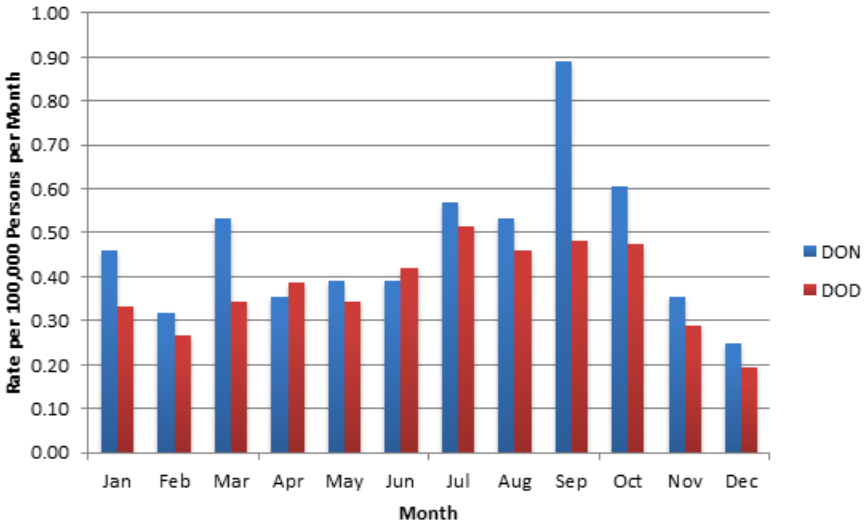
During 2013, *Acinetobacter* incidence rates in the DON and DOD were below the historic mean incidence rates for each quarter (Q). Additionally, the quarterly incidence rates reflected seasonal fluctuations with higher rates in quarter three (Table 1), when temperatures are usually higher. Figure 1 shows the monthly incidence rates for the DON and DOD beneficiary populations. The highest infection rates for both the DON and DOD occurred in the months of July through October (Q3).

Table 1. *Acinetobacter* Quarterly Incidence Rates for DON, DOD and Historic DOD Mean Incidence Rate per 100,000 Persons Per Quarter, 2013

Quarter	DON 2013	DOD 2013	DOD Historic Mean[a]
1	1.21	0.90	2.02
2	1.10	1.13	2.51
3	1.99	1.42	3.22
4	1.21	0.96	2.53

[a]Historic mean calculated as an average rate for DOD *Acinetobacter* cases from 2005-2012 by quarter.
Data are from the HL7 formatted microbiology and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 19 June 2014.

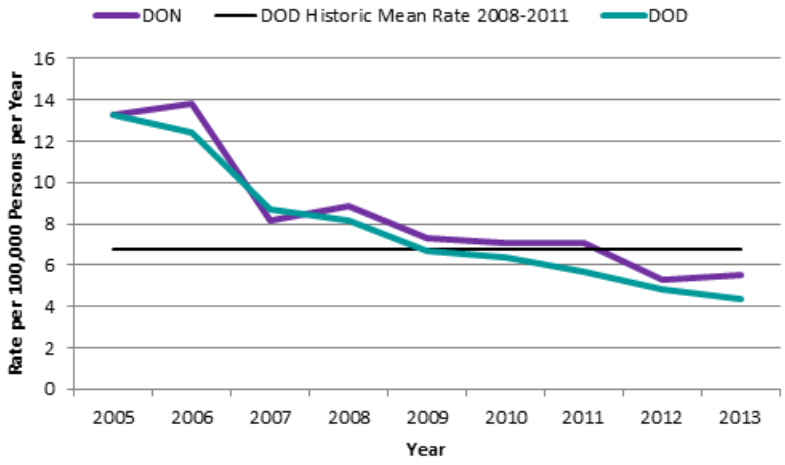
Figure 1. *Acinetobacter* Species Incidence Rates in Eligible DON and DOD Beneficiaries by Month, 2013



Data are from the HL7 formatted microbiology and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 18 June 2014.

Figure 2 displays the DON and DOD annual historical trends from 2005-2013. The incidence of *Acinetobacter* in the DON decreased 58.6% from 2005 to 2013, while the incidence of *Acinetobacter* in the DOD decreased 66.9%. The DON and DOD rates for 2013 (5.5 and 4.4 per 100,000 persons per year, respectively) were below the historic DOD mean incidence rate (6.7 per 100,000 persons per year). The 2013 rate in the DON increased slightly (3.8%) from 2012, while the DOD rate continued to descend and was the lowest rate seen since MHS-wide surveillance began in 2005.

Figure 2. *Acinetobacter* Species Incident Rates among DON and DOD Beneficiaries, 2005-2013, with Historic Mean Incidence Rate



Historic mean incidence rate for the DOD is 6.7 per 100,000 persons per year.
Data are from the HL7 formatted microbiology and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 10 July 2014.

Table 2 shows the demographics and annual prevalence rates for DON and DOD *Acinetobacter* cases. The EDC identified 159 *Acinetobacter* cases among 153 DON beneficiaries and 420 *Acinetobacter* cases among 400 DOD beneficiaries. For both the DON and DOD, the highest rates occurred in men, beneficiaries between the ages of 18 and 24, and OCONUS beneficiaries. Marine Corps beneficiaries had the highest *Acinetobacter* prevalence rate, with rates almost three times higher than Navy beneficiaries. The active duty beneficiary rate was also at least two times higher than any other beneficiary categories.

Table 2. Demographics of *Acinetobacter* Burden in the DON and DOD, CY 2013

DON			DOD		
N = 159	Count	Rate[a]	N = 420	Count	Rate[a]
Gender			**Gender**		
Female	71	5.3	Female	185	4.1
Male	88	6.0	Male	235	5.0
Age Group			**Age Group**		
0-17 years	33	5.8	0-17 years	88	4.5
18-24 years	44	10.1	18-24 years	96	8.0
25-34 years	27	7.5	25-34 years	69	5.8
35-44 years	17	6.9	35-44 years	35	4.3
45-64 years	19	3.0	45-64 years	61	2.9
65+ years	19	3.3	65+ years	71	3.4
Sponsor Service			**Sponsor Service**		
			Air Force	69	2.7
			Army	192	4.9
Marine Corps	78	10.4	Marine Corps	78	10.4
Navy	81	3.9	Navy	81	3.9
Beneficiary Type			**Beneficiary Type**		
Active duty	57	11.0	Active duty	136	9.7
Family member	75	4.7	Family member	204	3.9
Retired	23	3.7	Retired	67	3.2
Other	4	4.5	Other	13	2.2
Location			**Location**		
CONUS	144	5.4	CONUS	357	4.1
OCONUS	14	14.0	OCONUS	49	13.2
Unknown[b]	1		Unknown[b]	14	

[a]Rates per 100,000 eligible beneficiaries in each demographic category.
[b]TRICARE service region cannot be identified from the microbiology record.
Data are from the HL7 formatted microbiology and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 10 July 2014.

Table 3 displays the clinical characteristics of the *Acinetobacter* cases in the DON and DOD. Most isolates were collected in the outpatient setting and from non-sterile body sites. The most common causative agent of *Acinetobacter* cases was *A. baumannii* in the DON (37.1%) and

Acinetobacter species, not otherwise specified (NOS) in the DOD (32.4%). In the DON, 8.2% of *Acinetobacter* isolates were MDR and 2.5% were XDR. In the DOD, 6.7% of cases were MDR and 1.2% were XDR. Of the 153 unique DON beneficiaries, 4 beneficiaries had more than 1 laboratory-confirmed *Acinetobacter* case and accounted for 10 cases; 3 of the 10 were MDR, and the remaining 7 did not exhibit any level of resistance (MDR, XDR, or PDR) (data not shown). Eleven people accounted for 31 *Acinetobacter* cases in the DOD; 10 of the 31 cases were MDR, and 1 was XDR while the remaining 20 cases did not exhibit any level of resistance (data not shown).

Twenty-three DON beneficiaries were hospitalized with *Acinetobacter* in 2013. Four (17.4%) of the 23 hospitalizations were HA cases and one (4.3%) was an HO case. The remaining 18 hospitalizations (78.3%) were CO cases. Fifty-one DOD beneficiaries were hospitalized with *Acinetobacter* in 2013. Eight (15.7%) of these 51 hospitalizations were HA cases and 2 (3.9%) were HO cases. The remaining 41 hospitalizations (80.4%) were CO cases.

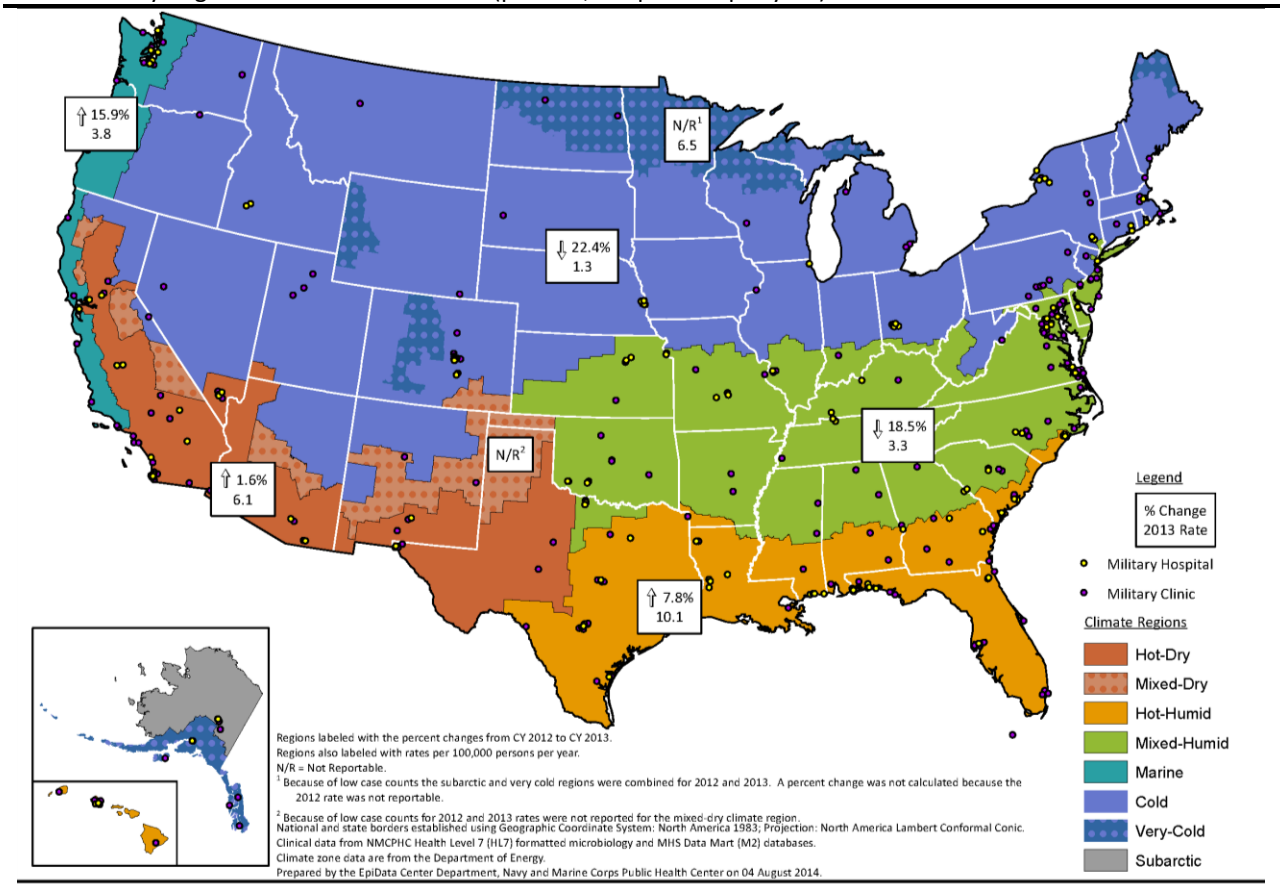
Table 3. Clinical Description of *Acinetobacter* Species Burden in the DON and DOD, CY 2013

DON			DOD		
N = 159	**Count**	**Percent**	**N = 420**	**Count**	**Percent**
Encounter Type			**Encounter Type**		
Outpatient	136	85.5%	Outpatient	369	87.9%
Inpatient	23	14.5%	Inpatient	51	12.1%
Healthcare Association[a]			**Healthcare Association[b]**		
Community onset (CO)	18	78.3%	Community onset (CO)	41	80.4%
Healthcare associated (HA)	4	17.4%	Healthcare associated (HA)	8	15.7%
Hospital onset (HO)	1	4.3%	Hospital onset (HO)	2	3.9%
Infection Type			**Infection Type**		
Non-sterile	93	58.5%	Non-sterile	227	54.0%
Skin and soft tissue infections (SSTI)	57	35.8%	Skin and soft tissue infections (SSTI)	174	41.4%
Sterile	9	5.7%	Sterile	19	4.5%
Species			**Species**		
A. baumannii	59	37.1%	*A. baumannii*	108	25.7%
Acinetobacter species, NOS	45	28.3%	*Acinetobacter* species, NOS	136	32.4%
A. calcoaceticus-baumannii complex	28	17.6%	*A. calcoaceticus-baumannii* complex	101	24.0%
A. lwoffii	18	11.3%	*A. lwoffii*	50	11.9%
A. calcoaceticus	5	3.1%	*A. calcoaceticus*	17	4.0%
A. hemolyticus	3	1.9%	*A. hemolyticus*	5	1.2%
A. junii	1	--	*A. junii*	3	0.7%
A. johnsonii	0	--	*A. johnsonii*	0	0.0%
A. anitratus	0	--	*A. anitratus*	0	--
Antibiotic Resistance			**Antibiotic Resistance**		
Multidrug (MDR)	13	8.2%	Multidrug (MDR)	28	6.7%
Extensively drug (XDR)	4	2.5%	Extensively drug (XDR)	5	1.2%
Pandrug (PDR)	0	--	Pandrug (PDR)	0	--
None[c]	142	89.3%	None[c]	387	92.1%

[a]Percentage of DON hospitalizations (N = 23).
[b]Percentage of DOD hospitalizations (N = 51).
[c]No level of multidrug resistance (MDR, XDR, or PDR) was detected.
Data are from the HL7 formatted microbiology, SIDR, and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 10 July 2014.

The EDC compared the prevalence rates of *Acinetobacter* cases identified in 2013 to the 2012 prevalence rates according to climatic region. Rates of *Acinetobacter* cases increased in the marine, hot-dry, and hot-humid regions and decreased in the mixed-humid and cold regions. The highest prevalence rates occurred in the hot-humid climate region; the lowest occurred in the cold climate region. The most drastic changes from 2012 occurred in the marine climate region with an increase of 15.9% from 2012 and the cold climate region with a 22.4% decrease from 2012 (Figure 3). A map displaying the distribution of *Acinetobacter* cases in DOD beneficiaries in the US and abroad along with the percentage of resistance is included in Appendix A (Figure A1).

Figure 3. CONUS Climate Region Distribution and Percent Change of *Acinetobacter* Cases from CY 2012 to CY 2013 in the DOD by Region with Prevalence Rates (per 100,000 persons per year)



Trimethoprim/sulfamethoxazole was overall the most commonly prescribed antibiotic in the DON for *Acinetobacter* cases that were not resistant; ciprofloxacin was the second-most commonly prescribed antibiotic. Trimethoprim/sulfamethoxazole was the most commonly prescribed oral antibiotic and piperacillin/tazobactam was the most commonly prescribed IV antibiotic. Table 4 includes a list of the most common DON prescriptions for *Acinetobacter* cases. Regardless of administration route, the following antibiotics were all equally common in the DON for resistant *Acinetobacter* cases: colistin, minocycline, piperacillin/tazobactam, and trimethoprim/sulfamethoxazole (data not shown).

Table 4. Antibiotic Prescriptions for Non-Multidrug Resistant *Acinetobacter* Species Cases in the DON, CY 2013

Class	Oral (N = 60)		Intravenous (N = 21)		Antibiotic most frequently prescribed in class (overall)
	Count	Percent	Count	Percent	
Sulfonamides	24	40.0%	0	0.0%	Trimethoprim/Sulphamethoxazole*
Fluoroquinolones	21	35.0%	3	14.3%	Ciprofloxacin
Lincosamides	6	10.0%	2	9.5%	Clindamycin*
Penicillins and Inhibitors	2	3.3%	5	23.8%	Piperacillin/Tazobactam
Cephalosporins	2	3.3%	5	23.8%	Ceftriaxone
Carbapenems	1	1.7%	5	23.8%	Meropenem
Tetracyclines	2	3.3%	0	0.0%	Doxycycline*
Macrolides	1	1.7%	0	0.0%	Azithromycin*
Polymyxins	1	1.7%	0	0.0%	Colistin*
Aminoglycosides	0	0.0%	1	4.8%	Amikacin*

N = Number of cases with at least antibiotic of that type (oral or intravenous).
*Only antibiotic in class prescribed.
Data are from the HL7 formatted pharmacy databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 19 June 2014.

Regardless of the route of administration, trimethoprim/sulfamethoxazole was the most commonly prescribed antibiotic in the DOD for *Acinetobacter* cases that were not resistant; ciprofloxacin was the second-most commonly prescribed antibiotic (data not shown). Trimethoprim/sulfamethoxazole was the most commonly prescribed oral antibiotic and piperacillin/tazobactam was the most commonly prescribed IV antibiotic (Table 5). For DOD resistant isolates, the most commonly prescribed antibiotic, regardless of the route of administration, was ciprofloxacin (data not shown).

Table 5. Antibiotic Prescriptions for Non-Multidrug Resistant *Acinetobacter* Species Cases in the DOD, CY 2013

Class	Oral (N = 187)		Intravenous (N = 64)		Antibiotic most frequently prescribed in class (overall)
	Count	Percent	Count	Percent	
Fluoroquinolones	67	35.8%	12	18.8%	Ciprofloxacin
Sulfonamides	63	33.7%	0	0.0%	Trimethoprim/Sulphamethoxazole*
Lincosamides	24	12.8%	2	3.1%	Clindamycin*
Penicillins and Inhibitors	4	2.1%	21	32.8%	Piperacillin/Tazobactam
Cephalosporins	7	3.7%	11	17.2%	Ceftriaxone
Carbapenems	1	0.5%	10	15.6%	Meropenem
Tetracyclines	10	5.3%	1	1.6%	Doxycycline
Macrolides	6	3.2%	2	3.1%	Azithromycin
Aminoglycosides	2	1.1%	4	6.3%	Tobramycin
Polymyxins	3	1.6%	1	1.6%	Colisitin & Polymyxin B

N = Number of cases with at least antibiotic of that type (oral or intravenous).
*Only antibiotic in class prescribed.
Data are from the HL7 formatted pharmacy databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 10 July 2014.

Table 6 displays an antibiogram of *Acinetobacter* species for DOD and DON beneficiaries. DON *Acinetobacter* species were most susceptible to cefepime (93.0%) followed by gentamicin and imipenem (both with 92.3%) and least susceptible to ampicillin (8.3%). DOD *Acinetobacter* species were most susceptible to gentamicin (94.5%) followed by levofloxacin (94.1%) and least susceptible to nitrofurantoin (6.1%).

Table 6. Antibiogram of DON and DOD *Acinetobacter* Species Isolates, CY 2013

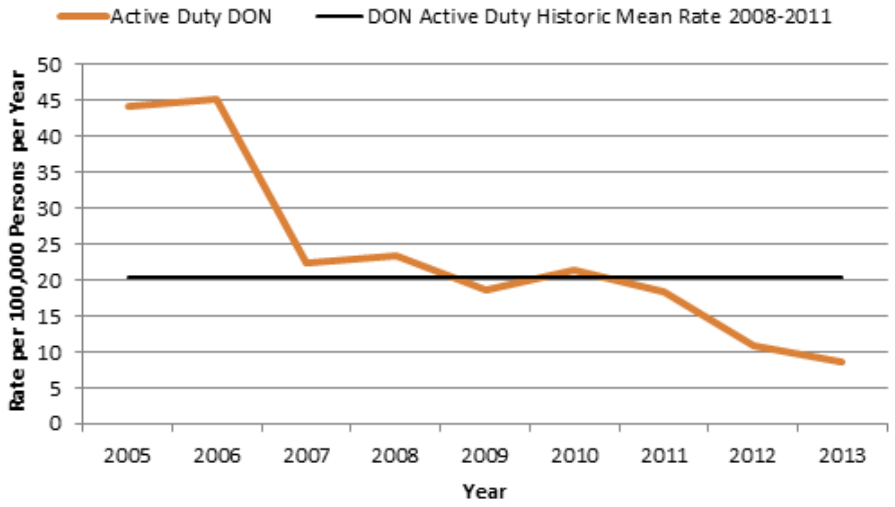
Population			Amikacin	Amoxacillin/ Clavulanate	Ampicillin	Ampicillin/ Sulbactam	Cefepime	Cefotaxime	Ceftazidime	Ceftriaxone	Ciprofloxacin	Gentamicin	Imipenem	Levofloxacin	Meropenem	Nitrofurantoin	Piperacillin	Pipperacillin/ Tazobactam	Tetracycline	Tobramycin	Trimethoprim/ Sulfamethoxazole
DON	N = 153	% Susceptible	77.8	--	8.3	90.0	93.0	--	86.1	36.2	36.2	92.3	92.3	89.3	--	--	--	--	80.0	91.6	85.0
		# Tested[a]	45		36	70	94		72	94	94	142	78	75					30	83	120
DOD	N = 400	% Susceptible	89.7	39.4	12.5	91.2	89.5	56.6	87.9	41.5	41.5	94.5	93.4	94.1	85.7	6.1	65.1	83.6	90.3	93.4	90.0
		# Tested[a]	145	33	72	170	237	76	224	229	229	362	197	239	35	33	63	55	93	242	310

[a]Only antibiotics with ≥30 isolates tested were reported.
Data are from the HL7 formatted microbiology database.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 19 June 2014.

DON Active Duty

Overall for 2013, DON active duty service members had an *Acinetobacter* incidence rate of 8.6 per 100,000 active duty service members per year. The 2013 rate was lower than the 2012 rate by 21.1%. Figure 4 shows a statistically significant descending trend ($P \leq .01$) in incidence rates among DON active duty service members from 2005-2013 (percent change = -80.5%). The 2013 rate is 58.0% below the historic mean incidence rate (20.5 per 100,000 active duty service members per year).

Figure 4. *Acinetobacter* Species Incidence Rates among Active Duty DON Service Members with Historic Mean Incidence Rate, 2005-2013



Data are from the HL7 formatted microbiology and M2 databases and the DMDC active duty roster.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 16 July 2014.

Table 7 shows demographics for active duty DON personnel with *Acinetobacter* cases in 2013 and their corresponding demographic category prevalence rates. Active duty Marines had a rate about twice as high as their Navy counterparts. Additionally, active duty females had a rate also about twice that of males. Other demographic categories displaying the highest rates were, service members between the ages of 18 and 24, and MTF locations within the CONUS.

Table 7. Demographics of DON Active Duty *Acinetobacter* Species Burden, CY 2013

N = 45	Count	Rate[a]
Gender		
Female	12	17.0
Male	33	7.3
Age Group		
18-24 years	24	10.3
25-34 years	13	6.7
35-44 years	8	10.1
45-64 years	0	--
65+ years	0	--
Sponsor Service		
Marine Corps	28	14.4
Navy	17	5.2
Location		
CONUS	42	9.4
OCONUS	3	*N/R*[b]

[a]Rates per 100,000 DON active duty service members in each demographic category for each service.
[b]Rates for case counts <5 are considered insignificant and not-reportable (*N/R*).
Data are from the HL7 formatted microbiology and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 18 November 2014.

Table 8 shows the clinical characteristics of DON active duty *Acinetobacter* cases. Overall, organisms were primarily identified in the outpatient setting and from SSTIs. Nine (20.0%) DON active duty service members with *Acinetobacter* were hospitalized in CY 2013. One (11.1%) of these hospitalizations was an HA case, while the remaining eight (88.9%) were CO cases. *Acinetobacter* species NOS were isolated most often among active duty DON service members overall. Five *Acinetobacter* cases were classified as MDR and one as XDR; the remaining 39 cases were not resistant. Surveillance identified no PDR cases.

Table 8. Clinical Description of Active Duty *Acinetobacter* Species Burden in the DON, CY 2013

N = 45	Count	Percent
Encounter Type		
Outpatient	36	80.0
Inpatient	9	20.0
Healthcare Association[a]		
Community onset (CO)	8	88.9
Healthcare associated (HA)	1	11.1
Hospital onset (HO)	0	--
Infection Type		
Skin and Soft Tissue Infection (SSTI)	24	53.3
Non-sterile	20	44.4
Sterile	1	2.2
Species		
Acinetobacter species, NOS	20	44.4
A. baumannii	14	31.1
A. calcoaceticus-baumannii complex	6	13.3
A. lwoffii	5	11.1
A. calcoaceticus	0	--
A. hemolyticus	0	--
A. junii	0	--
A. johnsonii	0	--
A. anitratus	0	--
Antibiotic Resistance		
Multidrug (MDR)	5	11.1
Extensively drug (XDR)	1	2.2
Pandrug (PDR)	0	--
None[b]	39	86.7

[a]Percentage per number of inpatient cases.
[b]No level of multidrug resistance (MDR, XDR, or PDR) was detected.
Data are from the HL7 formatted microbiology, SIDR, and M2 databases.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 18 November 2014.

DON Recruits

The incidence rate of *Acinetobacter* among DON recruits was 26.0 per 100,000 recruits per year in CY 2013. Table 9 presents the demographics of DON recruit *Acinetobacter* cases. The majority of DON recruit cases occurred in Marines with an incidence rate of 48.6 per 100,000 Marine recruits per year; the Navy recruit rate was not reportable (N/R). The highest rates occurred among female recruits and recruits between the ages of 16 and 24.

Table 9. Demographics of Recruit *Acinetobacter* Species Burden in the DON, CY 2013

N = 20	Count	Rate[a]
Gender		
Female	5	39.0
Male	15	23.4
Age Group		
16-24 years	18	25.0
25-34 years	2	*N/R*[b]
Sponsor Service		
Marine Corps	17	48.6
Navy	3	*N/R*[b]

[a]Rates per 100,000 DON recruits.
[b]Rates for case counts <5 are considered insignificant and not-reportable (*N/R*).
Data are from the HL7 formatted microbiology database and the DMDC active duty roster.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 10 July 2014.

Table 10 displays the clinical characteristics of *Acinetobacter* species isolated among DON recruits. All isolates were collected in the outpatient setting, primarily from SSTI specimen sources. *A. baumannii* and *Acinetobacter* species NOS were the most common species isolated. One MDR *Acinetobacter* case was identified in a Marine recruit. No DON recruits were identified as cases associated with the healthcare setting in CY 2013.

Table 10. Clinical Description of DON Recruit *Acinetobacter* Species Burden in the DON, CY 2013

N = 20	Count	Percent
Encounter Type		
Outpatient	20	100.0
Inpatient	0	0.0
Healthcare Association		
Hospital onset (HO)	0	--
Healthcare associated (HA)	0	--
Community onset (CO)	0	--
Infection Type		
Skin and Soft Tissue Infections (SSTI)	11	55.0
Non-sterile	9	45.0
Sterile	0	--
Species		
A. baumannii	9	45.0
Acinetobacter species NOS	9	45.0
A. lwoffii	2	10.0
A. calcoaceticus-baumannii complex	0	--
A. calcoaceticus	0	--
A. hemolyticus	0	--
A. junii	0	--
A. johnsonii	0	--
A. anitratus	0	--
Antibiotic Resistance		
Multidrug (MDR)	1	5.0
Extensively drug (XDR)	0	--
Pandrug (PDR)	0	--
None[a]	19	95.0

[a]No level of multidrug resistance (MDR, XDR, or PDR) was detected.
Data are from the HL7 formatted microbiology database, SIDR database, and the DMDC active duty roster.
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 10 July 2014.

Discussion

The incidence rate of *Acinetobacter* infections in the DON and DOD beneficiary populations continued to decline in 2013, remaining below the historic mean incidence rate from 2005-2011. This report suggests that recent *Acinetobacter* incidence follows previously observed disease dynamics within the DON and DOD. Monthly incidence rates in the DON and DOD display the expected seasonality of *Acinetobacter* species, as the summer and fall months coincide with the highest incidence rates. Rates for DON and DOD beneficiaries were highest in the summer and fall.

Marine Corps prevalence rates were higher than the rates for all other service beneficiary groups across all populations in 2013. More in depth analysis of Marine Corps beneficiary cases showed the case demographics distribution was highly skewed toward higher rates among active duty service members and those between the ages of 18 and 24 (active duty service members accounted for the majority of cases in this age group). However, further analysis has shown that though on appearance the prevalence among Sailors and Marines seems quite different given the large disparity between the magnitudes of their respective rates, there is statistically no difference between the populations. Therefore, it can be concluded that the prevalence of active duty Marines and Sailors is actually similar to each other and not of particular concern to either group.

Climate and seasonality are both important factors in the propagation of *Acinetobacter*, which flourishes in warm, humid environments.[3,5-7] DON and DOD rates peaked during the summer months (June-August) and began to decrease in the fall (September-November) with the lowest rates in winter and spring (December-May). The CONUS rates by climatic region clearly show that regions with high heat and/or humidity had the highest rates of infection. Overall, *Acinetobacter* cases in the DOD aligned with the normal variability of the organism and followed typical geographical and seasonal patterns.

Acinetobacter resistance to multiple antibiotics remains relatively low as only 8.2% (N = 13) of DON cases were MDR and 2.5% (N = 4) of DON cases were XDR. DON active duty service members (none of whom were deployed in 2013) accounted for 12 of the 13 DON MDR cases and 1 of the 4 XDR cases. In a previous analysis of CY 2012 deployment-related *Acinetobacter* cases in the US Central Command (CENTCOM), the EDC found that 31.0% of DON active duty service member cases who had been deployed were MDR (N = 13) and 2.4% were XDR (N = 1). Though these counts are too low to make any statistical conclusions, deployment-related cases tend to be more resistant than active duty non-deployment related cases.

Among all beneficiaries, the burden of *Acinetobacter* lies with those in CONUS for both the DOD and DON in 2013. The OCONUS rate was much smaller than CONUS rates in both the DON and DOD indicating that overall, CONUS beneficiaries were more heavily impacted. Additionally, the highest proportion of cases has historically been seen OCONUS; however, in 2013, for the first time since MHS-wide surveillance began, a higher proportion of cases was seen in the CONUS. Furthermore, CO cases accounted for 80.4% of all *Acinetobacter* cases in

the DOD in 2013, indicating that the vast majority were unrelated to contact with MTFs. Purchased care contact could not be evaluated with available data sources, therefore a portion of these cases may be HA but were misclassified as a result of the lack of purchased care data. However, from 2005-2012 there was a steady increase in the proportion of CO cases over time, indicating a pattern of change. The reduction in the overall rates, increase in the proportion of CO cases, and the change in the location of the highest proportion of cases from OCONUS to CONUS suggest that while in previous years *Acinetobacter* incidence was driven by OCONUS cases, possibly related to deployment for OIF/OEF, a baseline of *Acinetobacter* incidence within CONUS has existed. This evidence lends credence to the idea that community reservoirs might exist and this could also potentially be evidence of a change in epidemiology of *Acinetobacter* within the MHS to something more closely related to the pre-war baseline. With changing operational tempo of deployed service members, the risk of acquiring novel, highly resistant strains of *Acinetobacter* lessens and thus reduces the risk among active duty personnel. With a reduced risk to active duty personnel there is also a reduced risk of spreading those novel, highly resistant strains within MTFs, the DOD beneficiary population, and the general US population. Continued monitoring is necessary to validate the existence of new trends.

There was an overall descending trend of *Acinetobacter* incidence in DON active duty service members from 2005-2013. The descending trend is likely the reflection of one or a combination of the following: a better understanding of the epidemiology of *Acinetobacter* (primarily among deployed service members), the development of standard infection control and treatment practices for combat-related infections, and changes in operational tempo of OIF/OEF, as well as the drawdown of service members deployed to CENTCOM.

Female active duty DON service members experienced a higher prevalence rate than their male counterparts in 2013. The case count between the two groups however, shows that males have a higher case count and account for 73.3% of all DON active duty cases. Yet, females have a prevalence rate about twice that of active duty males, while accounting for only 26.7% of overall cases. With such a small case count, further stratification of female active duty cases provided no insight as to the potential cause for the higher rate. Therefore, continued close monitoring of active duty females is recommended to monitor the situation for any novel patterns.

The majority of DON *Acinetobacter* cases among recruits occurred among Marine recruits between the ages of 16 and 24. Both Marine Corps Recruit Depots (MCRDs) are located in warm areas of the US (South Carolina and southern California), which present conditions favorable to the growth of *Acinetobacter* species. As such, the higher prevalence among Marine recruits can partially be attributed to the climatic conditions associated with the locations of the MCRDs. Another contributing factor to the high Marine recruit prevalence could be related to the unique environmental conditions associated with recruit training as well as the longer training period for Marine recruits. The Naval Training Center is located in Great Lakes, Illinois, which experiences, on average, a cooler and less humid climate than the MCRDs and may be a reason why the DON identified very few cases of *Acinetobacter* among Navy recruits. One Navy recruit case was MDR, a slight but insignificant increase from 2012 when no resistant DON recruit cases were identified, indicating that resistance is not a current concern in this

population. Monitoring of the recruit population should continue for any emergent infections and drug resistance.

This annual report summarized *Acinetobacter* species incidence and prevalence in the DON and DOD beneficiary populations in 2013 and reported changes from previously identified trends. Given *Acinetobacter*'s evolving resistance and historical association with deployment-related infections, it is important to monitor and manage the risk to the DOD population at large. Therefore, continued surveillance of *Acinetobacter* is necessary to monitor and document any changes in burden and drug resistance.

Limitations

HL7 formatted data are generated within the CHCS at fixed MTFs. Microbiology testing results only list the organism(s) that were identified, not the intended tests (e.g., if a physician suspects an organism different from the one that was identified, the record will not show the organism that the physician suspected). Microbiology data are used to identify laboratory confirmed cases of illness. However, the microbiology data does not capture cases in which a physician chose to treat presumptively without laboratory confirmation. Clinical practices also vary among providers and facilities. For example, some clinicians may not perform cultures for confirmatory tests for patients with influenza-like illness symptoms or for patients with superficial infections who are treated presumptively. Therefore, the isolate counts here are likely an underestimate of the actual burden of *Acinetobacter* species in the DOD.

The use of microbiology data for analysis of antibiotic resistance is limited by the practice of cascade reporting, where antibiotic sensitivity results are conditionally reported to CHCS to guide treatment decisions. DOD MTFs practice cascade reporting to varying degrees. Furthermore, not all laboratories in the DOD operate under the same version of CLSI guidelines. As a result, certain facilities use guidelines with outdated antibiotic susceptibility breakpoints and may incorrectly report some susceptibilities. Thus, the EDC cannot project a complete picture of the susceptibility patterns for *Acinetobacter* species isolates and the presumption of reduced susceptibility is applied to all antibiotics in a class if an isolate is shown to be resistant to that class.

Rate calculations based on climatic region is limited by the availability of denominators. To provide meaningful rates, climate regions were grouped around state lines, which do not necessarily align with the true climate patterns within the US. Each state was grouped into the climatic region that was occupied by the majority of the state, thus slightly altering the true climatic pattern within the US. The climatic rates and percent changes therefore slightly vary from the true climatic rate. However, these modifications were few and the variation from the true rate is therefore minimal. These rates were a reflection of burden within a climatic region, not exposure. Deployment-related cases were not removed from the calculations and affect the ability to relate the reported rates to exposure.

A SIDR is created at discharge or transfer from an inpatient MTF for all TRICARE beneficiaries. For active duty personnel, this occurs for non-military medical treatment facility discharges as well. Data for medical surveillance are considered provisional and medical case counts may change if the discharge record is edited after the patient is discharged from the MTF. As this report presents an annual summary and several months were allotted in the new year to account for possible data lag and record corrections, it can be presumed with relative certainty that the records identified are the final and complete records for an inpatient encounter; however, the possibility does exist that records still may be modified, thereby altering the case counts. SIDR data are also limited in that it is difficult to associate a specific microbiology record with an anatomical location of an injury, particularly when a patient has multiple injuries identified in the record. This makes it difficult to definitively link an injury to a specific infection difficult.

Ambulatory records are created at the close out of an outpatient medical encounter at DOD MTFs for all TRICARE beneficiaries.

DMDC stores data on service members using multiple rosters. The active duty roster contains all active duty service members and should include activated reservists. However, anecdotal analyses conducted by the EDC suggest that not all activated reservists are listed on the active duty roster. Additionally, DMDC records are created only once a month. If a reservist was activated after his or her record was created, the record would not reflect the change in status until the following month. While this is the exception and not the standard for DMDC records, identification of active duty service members is incomplete as a result.

Providers may not have prescribed the antibiotics in response to the *Acinetobacter* infection. It is possible that antibiotics dispensed around the same timeframe of *Acinetobacter* culture reflects treatment for other reasons. Additionally, cases where a physician chose to treat presumptively were not captured because HL7 microbiology records were used to define cases. Because only *Acinetobacter* species isolates were identified, this analysis did not afford the opportunity to consider if patients had a concurrent infection with another organism for which a prescribed antibiotic could have alternatively been intended. However, the majority of antibiotics prescribed were antibiotics that could be used in the treatment of an *Acinetobacter* infection, suggesting that that isolate was the intended target for the antibiotic prescription.

All the above mentioned databases are limited in that they do not include data from purchased care providers, shipboard facilities, battalion aid stations, or in-theater facilities. Therefore, these results are only an estimate of the true *Acinetobacter* species infection burden in the DON and DOD. In addition, this report did not consider deployment exposure and the proportion of cases imported from outside the treating MTF's geographic area is unknown.

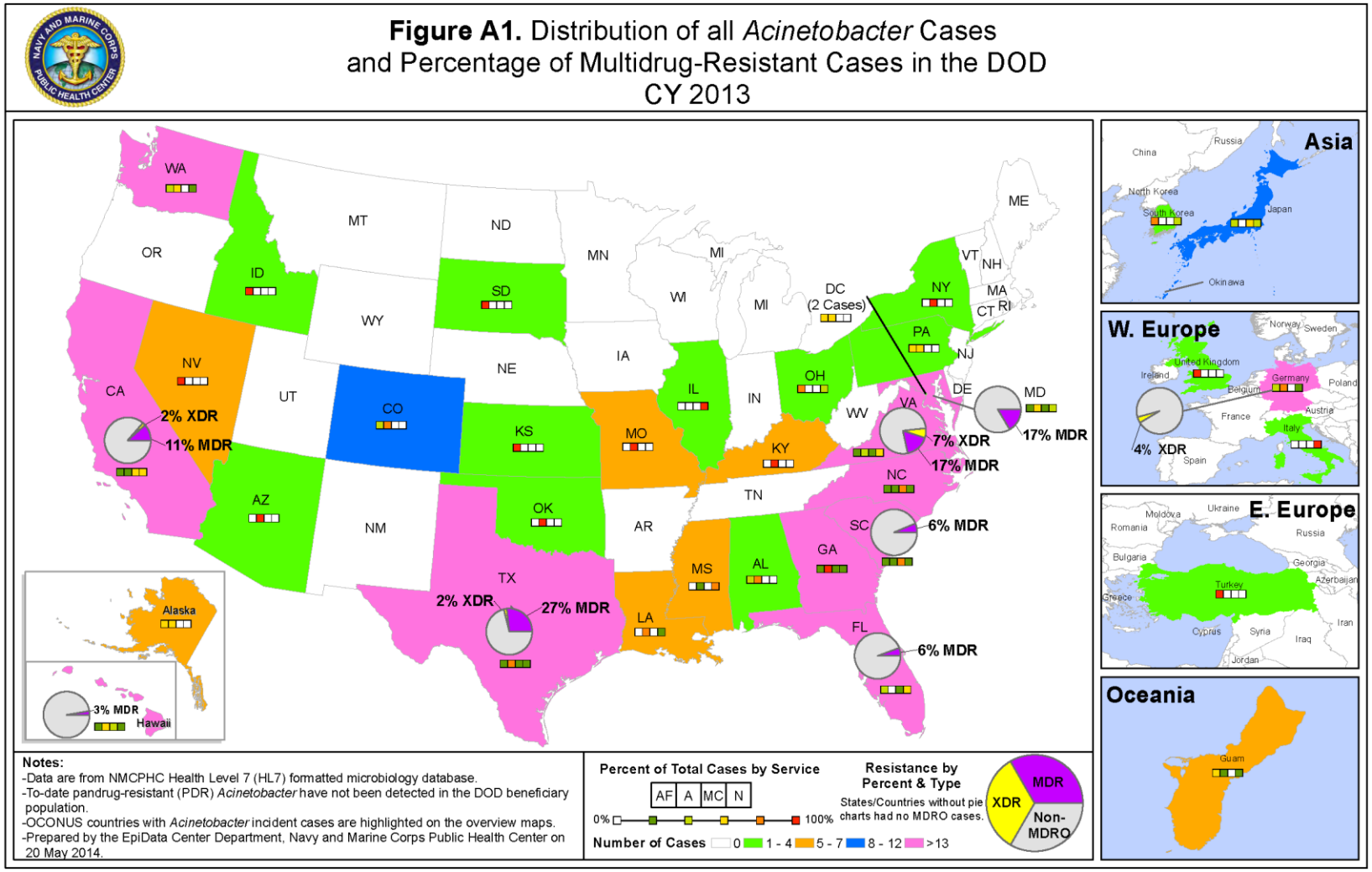
Appendix A

Table 11. Antibiotic Classes Used to Identify the Level of Multidrug Resistance in *Acinetobacter* Species

Antibiotic Classes	Antibiotic
Aminoglycosides	Gentamicin
	Tobramycin
	Amikacin
	Netilmicin
Antipseudomonal carbapenems	Imipenem
	Meropenem
	Doripenem
Antipseudomonal fluoroquinolones	Ciprofloxacin
	Levofloxacin
Antipseudomonal penicillins & β-lactamase inhibitors	Piperacillin/Tazobactam
	Ticarcillin/Clavulanic acid
Extended-spectrum cephalosporins	Cefotaxime
	Ceftriaxone
	Ceftazidime
	Cefepime
Folate pathway inhibitors	Trimethoprim/Sulfamethoxazole
Penicillins & β-lactamase inhibitors	Ampicillin/Sulbactam
Polymyxins	Colistin
	Polymyxin B
Tetracyclines	Tetracycline
	Doxycycline
	Minocycline

Multidrug-resistant (MDR): non-susceptible to ≥1 antibiotic in ≥3 antimicrobial categories.
Extensively drug-resistant (XDR): non-susceptible to ≥1 antibiotic in all but 1 or 2 antimicrobial categories.
Pandrug-resistant (PDR): non-susceptible to all antibiotics listed.
[a]Table modified from Magiorakos et al., 2012.[21]
Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center, on 14 August 2014.

Figure A5. Distribution of all *Acinetobacter* Cases and Percentage of Multidrug-Resistant Cases in the DOD, CY 2013



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Acronym/Abbreviation List

Acronym/Abbreviation	Definition
ABC	*A. baumannii-calcoaceticus* complex
CENTCOM	United States Central Command
CHCS	Composite Health Care System
CLSI	Clinical and Laboratory Standards Institute
CO	Community-onset
CONUS	Continental United States
CY	Calendar year
DMDC	Defense Manpower Data Center
DMIS ID	Defense Medical Information System Identification number
DOD	United States Department of Defense
DOE	United States Department of Energy
DON	United States Department of the Navy
EDC	EpiData Center Department
HA	Healthcare-associated
HL7	Health Level 7
HO	Hospital-onset
IV	Intravenous
M2	MHS Data Mart
MCRD	Marine Corp Recruit Depot
MDR	Multidrug-resistant
MEPRS	Medical Expense and Performance Reporting System
MHS	Military Health System
MTF	Military treatment facility
N/R	Not reportable
NOS	Not otherwise specified
OCONUS	Outside of the continental United States
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PDR	Pandrug-resistant
Q	Quarter (yearly)
SIDR	Standard Inpatient Data Record
SSTI	Skin and soft tissue infection
US	United States
WHO	World Health Organization
XDR	Extensively drug-resistant